



State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Water Monitoring and Standards
401 E. State Street, P.O. Box 420 MC 401-041
Trenton, New Jersey 08625-0420
Phone (609) 292-1623 Fax (609) 633-1276

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

June 1, 2012

Jeffrey Gratz, Chief, Water Programs Branch,
Division of Environmental Planning and Protection
United States Environmental Protection Agency – Region 2
290 Broadway
New York, NY 10007-1866

Dear Mr. Gratz,

The technical support document entitled "Pathogen Indicator Organism TMDLs for the Hackensack and Passaic Rivers supporting Primary Contact Recreation" was transmitted to us on March 15, 2012. The document was reviewed to determine if it provided a sufficient technical basis to proceed with pathogen TMDLs for the Passaic and Hackensack Rivers. The document was found to be deficient.

The most significant shortcoming of the technical support document is that EPA has not held the contractor to the Quality Assurance Project Plan (QAPP) standards. A QAPP sets forth the rigor that is to be applied to produce a defensible product. Key failings with respect to the QAPP include the quantity of data that was used in calibrating and validating the model for the waterbodies in question.

Very little data was used to populate the model and the data that was used fails to capture an appropriate range of conditions. There were five (5) samples that were collected in a one month period. There was only one wet weather event during this period.

There are no model skill assessments provided for the Hackensack and Passaic. Based on visual inspection of the graphs provided, the predictive power of the model is poor.

The Model Evaluation Group (MEG) offered comments on the model, including some comments specifically with respect to the Hackensack River model performance. It is unclear whether these comments were ever addressed, and the model adjusted.

A more detailed discussion of the deficiencies and technical flaws is provided in the Attachment.

Use of this flawed document to proceed with TMDL development could open the Department to major criticism and possible litigation. Substantial resources would be needed to address the deficiencies in the technical support document, (i.e. adhere to the QAPP, address the concerns raised by the MEG, obtain sufficient monitoring data to populate the model, and improve its predictive power) not to mention the time to make these corrections.

The Department would like to work with EPA to identify information within the technical support document that could be used to help inform future actions to improve water quality in this region.

Sincerely,



Jill Lipoti Ph.D., Director
Division of Water Monitoring & Standards

c: Michele Siekerka
Michele Putnam
Barbara Hirst

Harbor Pathogen TMDL documentation deficiencies and issues

May 30, 2012

The administrative record and draft TMDL components prepared by HydroQual and provided by EPA have been reviewed to determine if there is a sufficient technical and scientifically valid basis to proceed with pathogen TMDLs for the Passaic and Hackensack Rivers. These were the two waterbodies identified through the study of the NY/NJ Harbor for which a TMDL was identified as warranted, based on a premise that NJ would revise the Surface Water Quality Standards. The documentation has been found to be deficient in a number of respects, such that the Department cannot proceed with TMDL development with the documentation provided. The most important issue is that the provisions of the modeling QAPP were not adhered to with respect to the Hackensack and Passaic. For example, the data upon which the model was formulated for these waters was limited to 5 samples taken over a 1 month period, during which there was only one "wet" weather event. The predictive power of the model developed on such limited data is poor according to visual inspection of the graphs provided, but in fact no statistical skill assessments were provided as required in the QAPP. The work effort to develop a predictive tool in these waters is in sharp contrast to the main harbor waters, which were the focus of PWG and OG meetings over the years. It is of concern that the MEG comments on the RAINMAN model calibration as well as performance in the Hackensack River do not appear to have been addressed. A more detailed discussion of deficiencies and technical flaws is provided below, with key points flagged with a "►". The information provided is not without value and could assist the Department in moving forward with long term CSO controls, as described below.

1. Administrative Record: the documentation provided to date is sparse with respect to clearly documenting the basis for all of the inputs and decision points in TMDL development, which is noted as required and to be provided by the EPA contractor in the modeling QAPP for the project. Without this documentation, it is not possible to fully evaluate the technical merit of the basis for the TMDL. Even assuming the basis is valid, which it is not as discussed below, the provided record would be an inadequate basis to support legal challenges.
 - a. Document 1 is a PowerPoint presentation dated 9/27/05 to the MEG re: the PATH model. The bullet point statements do not provide meaningful information about what work was done; many figures are small and difficult to read; information regarding NJ standards is not fully accurate. The documentation that provides the basis for the PowerPoint statements should have been provided, including legible figures.
 - b. ► Documents 2, 3, 4 and 5 are comments from members of the pathogens model evaluation group (MEG). The title of the comments suggests they are a response to the 9/27/05 presentation to the MEG and others. It is not clear what information was actually provided to the MEG for review, before, during, or after the 9/27/05 meeting. It is likely that it included the graphs provided in Document 6, but may or may not have included supplemental information. Some of the comments provided express reservations about the model, specifically with respect to performance in the Hackensack River, as well as

requesting additional information about calibration of the RAINMAN component of the model. There is no indication that these issues were responded to or if the panels' concerns were finally satisfied. MEG comments include:

- i. Taft says model is useful to estimate geomeans in open waters, but should not be relied upon for simulating attainment of the single sample maxima (SSM) or in beach/surf areas where resuspension is likely; he does not explicitly state whether or not NJ tributaries fall within the "open waters", therefore it is unclear whether Taft would consider the tributaries as being within the realm of model utility;
 - ii. Uchirin similarly opines that the model is well calibrated for open waters but misses in areas where resuspension may be important;
 - iii. Currey opines that SWEM is a good choice for modeling transport, but notes the system-wide approach does not work as well in locations where CSO volumes are different than the system-wide assumptions; he cites the Hackensack as an area of concern (specifically, calibration charts are insufficient to allow determination of whether the system actually behaves as simulated, noting that there are very low values for several days at a time); he believes using a long averaging period may not result in the correct load reduction to achieve standards, and does not believe the model should be used to predict SSM values;
 - iv. Nix points out that the landside model is relatively simple and limits the skill of the more complex hydrodynamic/water quality models used, but acknowledges that even more complex landside models don't perform much better; Nix notes that RAINMAN does not seem to account for storage capacity properly; Nix requested to see how RAINMAN was calibrated, in addition to the outcomes.
- c. ► Document 6 (9/05) contains calibration charts, which are provided without any explanatory text or context relative to other modeling work. The calibration charts show that there are only 5 data points (although the text states 6 points) depicted against simulation graphs for various harbor waters; for the NJ waters, including Hackensack and Passaic, these points were from August and September 2003 only; in all cases, except beaches, they were not from the bathing season used to calculate the geomean in this study (10/02 to 5/03 or 11/02 to 6/03 were sampled, while the beach season for assessing compliance was May 15 through September 15). For the Hackensack and Passaic in particular, there is a significant discrepancy between the predicted values and the observed values. No skill assessment statistics are provided (as promised in the QAPP—see deficiencies re: QAPP below), but based on visual inspection, the predicted/observed values differ by orders of magnitude in some cases. Following submittal of the TMDL documentation, the Department asked EPA if there was any additional information regarding NJ waters beyond that which was submitted and the reply was that none had been found. Given the paucity of data and failure to capture an appropriate range of conditions for model calibration in the Hackensack and Passaic Rivers, the utility of the model as a predictive tool in these waters is suspect.
- d. Document 9 is provided as a discussion of BMP options to reduce pathogens from stormwater contributed by MS4 regulated sources. This document does not reflect issues

raised by NJDEP and the resolution thereof that led to the currently agreed upon TMDL assumption that 10% reduction from MS4 drainage areas (the SW input to the model) would be required/achieved through source control BMPs and that this represented the limit of technology for controlling this source from this category of drainage area. This document would have to be amended to reflect that its conclusions were superseded by subsequent discussions and decisions.

- e. ► Document 10 is the modeling QAPP for the project. This document is unsigned—the signed copy would be needed for the administrative record. Within the QAPP there are statements that monitoring was carried out under separate approved QAPPs, but the actual QAPPs were not provided. The Department has not been able to independently locate signed copies; they would need to be provided for the administrative record (p 1-1, p 2-2 includes titles and dates approved). There are a host of specifications contained in the QAPP which have not been met, which is problematic because the point of a QAPP is to establish the level of rigor needed for a scientifically valid study. Failing to adhere to the established level of rigor leaves the work subject to challenge. Some specific deficiencies are as follows: Documentation of the various MEG reviews—those in addition to the PATH MEG—should have been provided, including what was reviewed, what were the findings, recommendations for revisions, and how were any concerns addressed (p 1-5). There is some conflicting information within the documentation provided as to whether or not the enhanced version of SWEM was actually used in the PATH model; this would need to be clarified and justification provided if the enhanced SWEM was not used. It is stated (p 1-7) that MEG comments were to be addressed as an addendum to the QAPP, but as discussed, no information on what the MEG was given to review, or what responses were provided to the comments made was provided. The Margin of Safety (MOS) is stated to be explicit and at the 10% level (p 4-3); the TMDL report suggests an implicit MOS. This new approach should be satisfactorily explained and approved as an addendum to the QAPP, as the change is significant. Further, as noted in comments below, the implicit MOS discussion is unacceptable. P 4-6 describes a very specific calibration/validation process and states that the procedure and results will be documented in the TMDL report. The documentation to date fails to provide this key information. No documentation of sensitivity analyses or model performance statistics has been provided, as specified in Sections 4.3 and 4.4. Section 6 of the QAPP states that all the data and information used to develop the TMDL must be part of the administrative record and was to be provided. This is NJDEP's expectation and requirement and has not been satisfied. We are not confident that there is a clear and complete documentation of what the final determinations were and how they were derived given the list of document types noted in the QAPP as the required deliverable (p 6-2). The documentation provided to date does not explain the modeling calibration process, as promised at p 7-1.
- f. Document 11 is identified as Appendix A3 and contains the governing equations and parameter values for the model. It appears to be from a draft report. The full and final form of the document of which this appendix is a part would be needed to evaluate context and for proper citation.

- g. ► Document 12 is a summary of the RAINMAN calibration for the harbor waters. First, the report provided appears to be a draft as it contains hand mark ups. The Department does have a bound copy of this document without the hand mark ups, but this document still contains several notations of "check this" for NJ waters, suggesting the work intended was not completed at the time of report preparation, and may never have been completed. Noteworthy is the discrepancy between the information provided for NY and NJ systems. NY systems were extensively sampled for a year, system information is detailed and the resultant calibrations are generally quite good. The report lacks comparable information for NJ systems. Common regarding NJ waters are statements that flow monitoring was unavailable and that there was no cross calibration between models or between data and models. The calibration graphs provided in Document 6 may be a supplement to this report, but there are concerns about this document as well, see above. The TMDL outline states that where the RAINMAN simulations differed by more than 15% from the local SWMM or InfoWorks models developed by the CSO permittees, adjustments were made to RAINMAN. There is no documentation if/where this was done for NJ waters, nor any details about performance before and after the adjustments or the procedure for performing the adjustments. Note that the QAPP states calibration between models is essential (p 3-4). The TMDL outline states that there was a comparison between the characterization reports prepared by CSO permittees and the RAINMAN model and that the documentation of the RAINMAN/SWMM/InfoWorks cross calibration presented was at a 4/9/08 PWG meeting; however, there was no record of this meeting on the HEP webpage or provided in the TMDL documentation.
2. In formulating with EPA the outline of the information to be provided for the TMDL, the Department had asked that the CSO outfalls assumed to exist for modeling be crosswalked with NJPDES records of those that currently exist, as work has proceeded which resulted in some outfalls being eliminated. Also needed and not included would be a table depicting the loads per outfall and each other source under existing conditions as well as TMDL conditions. The sources considered in the model are identified by type, but without the required quantification. A full description of how each loading source was calculated/simulated is also missing. Even assuming issues related to how loads were calculated and the model utility itself were satisfactorily resolved, and assuming the endpoint used in the TMDL simulation was successfully adopted as the upgraded pathogen standard, accurate wasteload allocations cannot be assigned if the actual outfalls in existence are not as assumed in the model. The requested crosswalk was not provided on an outfall basis and the numbering used in the report cannot be fully matched with NJPDES IDs for outfalls. Based on an analysis of what was provided, it is clear that some outfalls are missing and others listed are no longer in operation. Given the significant uncertainties related to the actual number, location and input load from each CSO, the suggested WLAs per outfall can only be used as a rough guide as to the relative contribution of each outfall, which may help to inform the LTCPs going forward, provided the CSOs identified in the document are aligned with what is believed to exist.

3. The language provided in the TMDL outline re: revised SWQS is not appropriate. While there was preliminary discussion about the need to determine if the geomean value would be met on a year round basis under the TMDL, it was later agreed that there is no basis in the BEACH Act for evaluating this using an annual geomean. Therefore, reference to an annual geomean should be removed. DEP intends to develop an upgraded pathogen standard following adoption of revised recreational pathogen standards by EPA. NJ's revised standard will specify the averaging period for the geomean and the target hydrology or other design condition under which it applies. To address the shellfish designated use, it may also include an implementation standard to ensure that control measures are in place year round. The discussion regarding what was done to assess/attain direct harvest shellfish criteria is incomplete and in some respects inaccurate ("adverse conditions" described as "failure conditions" as an example).
4. The characterization studies for CSOs were carried out in terms of fecal coliform, but the SWQS will be expressed as enterococci; there is no discussion about how these two parameters have been reconciled for use in the model and to determine the reductions needed to meet an enterococci standard. The data and assumptions for conversion of FC to enterococci would be required, but may be problematic because of the fact that a statistically significant correlation between the two indicators has not been observed. EPA's Ambient Water Quality Criteria for Bacteria – 1986, EPA's Implementation Guidance for Ambient Water Quality Criteria for Bacteria – 2004 and EPA's Recreational Water Quality Criteria – 2012 all have demonstrated that *E. coli* and enterococci exhibited a strong correlation to swimming-associated gastrointestinal illness; on the other hand, fecal coliform exhibited poor or no correlation. Therefore, and as pointed out by EPA in 1986 and 2004 documents, the two indicators, FC and enterococci, would at best, exhibit a rough correlation.
5. Raw data used for assessing attainment of the existing and/or presumed upgraded standard, calculating/estimating boundary and other inputs to the model, or model calibration/validation have not been provided and would be needed for the administrative record. This would include ambient water quality data, CSO, stormwater and boundary water concentrations used to determine loads. In particular, the basis for the boundary input would need to be explained as there is an apparent discrepancy between what is stated in the 2002 Calibration Enhancement of SWEM in the NJ Tributaries (suggests actually sampling data was used) and what was actually done.
6. A statement is made in the TMDL outline without any substantiation:
 "The calibration of the parameter values and the validity of the equations for HEP waters were established over a number of years using data collected by multiple agencies ..." [section 4.2.1]
 As per the QAPP, a clear nexus between the inputs, assumptions and algorithms used in the model and the basis for their selection is needed and was not provided.
7. Statement at the end of section 4.2.3 of the TMDL outline that the PWG and OG believe that the model is suitable to develop TMDLs is not correct with regard to the subject waters. The record does not bear out that these groups, nor the MEG, have accepted the work completed to date as a valid basis for TMDLs in the subject waters.
8. a) Section 4.3.2 does not adequately explain the significance of/basis for the 3-year recurrence interval as the design condition for the TMDL. There was considerable discussion of the correct

endpoint conditions at PWG and OG meetings, including debate about whether the national CSO guidance to manage for average conditions or the normal path taken in TMDL development to select a reasonably critical condition should prevail for the pathogen TMDL in the harbor where CSOs were the most significant source. The significance/basis of the design condition for attaining the endpoint is of critical importance for when NJ proceeds with articulating the revised SWQS for currently downgraded waters. b) The TMDL outline suggests that there were “improvements” in the PATH model, when in fact a mistake was made to correct a double counting of Saddle River loads. Based on limitations of the PAT tool and mistakes made in loading inputs, EPA had agreed to an additional model run for the Passaic and Hackensack Rivers using the full 13-year simulation to determine if the full 87% and 70% reductions were still needed to hit target geomeans in the Passaic and Hackensack Rivers, respectively. This model run was not provided, but would be inappropriate to pursue at this time, given the fundamental flaws in the modeling basis for these rivers. There would need to be an explanation of why a 10% SW reduction was assumed and what actions were assumed that would achieve this reduction. [See comments on SW BMP white paper by HydroQual above. See section 4.4.2]

9. Section 4.4.1: need to document the selection of the 18 loading zones for the model. The Department had commented on this in the past and how the comments were addressed are not apparent in the record provided.
10. Section 5: The 8/13/08 document referred to was not provided.
11. The record does not provide any quantitative basis to support the statement that the 13 year simulation is an excellent representation of the 30 year simulation.
12. The model was based on existing flows—the impact of facilities receiving permitted flows on the CSO loads was not considered (additional sanitary flows in the conveyance facilities would likely increase the number/duration/volume of CSOs).
13. Section 6: explain—annual loading was used, does this mean that wet weather peaks were ignored?
14. Section 7: there is no definition of what a “wet day” is under the assumption that there are 123 wet days, nor an explanation of the significance of this assumption to the model outputs.
15. Section 8: The Department does not agree with many of the statements regarding the basis for assuming an implicit MOS and could not use as the MOS basis provided in a TMDL.
16. Section 13—The Department has reviewed the documentation on the HEP webpage regarding meetings held in the course of water quality study and finds that the minutes are in some cases incomplete (references are made to attachments which are not provided) and some are missing altogether. Documentation, including materials presented, for all meetings and follow-up correspondence related to this study would be needed for a complete record.